Independent peer review of

a) Combined status of blue and deacon rockfishes in US waters off California and Oregon and

b) California scorpionfish off Southern California

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Executive Summary

The panel review meeting for the combined Blue and Deacon rockfish (BDR) and California scorpionfish took place in Santa Cruz, California between July 24th and July 28th, 2017. The focus of the review was on the two stocks of Blue and Deacon rockfish off California and Oregon, and one stock of California scorpionfish found off southern California.

Both species were assessed using the length- and age-structured modelling software called Stock Synthesis, which has been extensively used for stock assessments in the West coast of the US. The assessments made use of a diverse set of data sources to capture the best scientific knowledge for the two species including fishery dependent and fishery independent abundance indices and length and age composition series. There was also further discussion at the review meeting about the best parametrisation of the models that led to the STAT making adjustments to their models.

Changes made to the original models included adjusting selectivity curves, changing the set up for recruitment deviations, and modifying the values or uncertainty characterising biological parameters used by the model.

For the two BDR stocks, the model results showed that the current stock size for the Oregon stock is well above management targets, but that was not the case for the California BDR stock. The model indicated that the relative spawning biomass for the California BDR is below the management target of 40%. For California scorpionfish, the model results indicated that the population size has been above the management target throughout the period covered in the assessment.

The final assessments proposed for all three stocks represent the best scientific information available for those stocks and provide robust results that can support management.

Background

The 2017 Benchmark stock assessments for the combined Blue and Deacon rockfish (BDR) and California scorpionfish took place in Santa Cruz, California between July 24th and July 28th, 2017. The focus of the review was on the two stocks of Blue and Deacon rockfish off California and Oregon, and one stock of California scorpionfish found off southern California.

Blue and Deacon rockfishes belong to the family of Sebastes and, until 2015, they were thought to be one species, "Blue Rockfish". Morphometric and microsatellite genetic analyses confirmed that there were two species. However, most of the historical data series available are for the complex, and have not been split into species-specific series. Generally, there are very little species-specific life history, distribution, and abundance data. Therefore, those two species are assessed again as a complex.

The distribution of BDR ranges from Baja California Sur, Mexico to the British Columbia, Canada, but Deacon rockfish seems to be more dominant on the northern side of that range while the opposite is true for Blue rockfish. The model assumes that there are two stocks, one off Oregon and one off California. BDR seems to live for more than 30 years although differences between maximum age for males and females have been reported. Although the two species share many similar characteristics, one difference that has been documented is age at maturity, with Blue rockfish reaching maturity at a younger age than Deacon rockfish. The California BDR was assessed in 2007, while the 2017 assessment was the first full assessment for the Oregon BDR.

Scorpionfish is one of the most common species of Scorpaena on the U.S. West Coast and is found from central California to Punta Eugenia, Baja California Sur, Mexico. However, it is not a major component of the fisheries off the West Coast of the US and there is very little discarding. The only exception to that was the period 2001-2005 when the fishery for this species was closed for part of the year. California scorpionfish lives for more than 20 years and exhibit aggregating behaviour (both spawning and non-spawning related). The stock was last assessed in 2005 using a length-based model and the results indicated that the stock had been overexploited in the past.

All three stocks considered here were assessed using the length- and age-structured modelling software called Stock Synthesis (SS). The software has been extensively used for stock assessments in the West coast of the US and elsewhere, and aims to provide a framework for combining information from different types of data to inform the model results about the status of the stock and impact of fishing pressure. The software includes two components: a population dynamics sub-model that simulates the age and length-specific structure of the population, and an observation sub-model which can make use of a wide range of data to calibrate the model. The observations that can be used in SS include: fishery CPUE or effort; survey abundance; discards; length-, age- and weight-composition data; and tag-recapture data (Methot and Wetzel, 2013).

The model for California scorpionfish included six fisheries; three commercial and three recreational, including one fleet representing discards from the recreational fishery. There were three commercial and two recreational fisheries for California BDR, as well as separate fleets used to simulate discards from both recreational and commercial fisheries. Five fisheries were also used for the Oregon BDR stock assessment, which also included discards for both recreational and commercial fisheries.

The assessments used both species-specific and related species data on important biological processes such as growth, maturation, and recruitment to produce equations to simulate those processes. However, some sources of uncertainty still remain important, including for natural mortality, fecundity, and maximum age.

The assessment calculated reference points based on SB40%, SPR 50%, and MSY that reflected targets used for the management of these fisheries. The assessment also did sensitivity analysis to test the effects of uncertainty on model results as important parameters could not be estimated and had to be fixed. Retrospective analyses and projections under different combinations of values of selected model parameters and for different future catch quotas were also run either during or after the meeting.

The original models were modified to reflect correction and modifications identified during the review meeting and reflect the best scientific information for these stocks.

The model results showed that the current stock size for the Oregon stock is well above management targets, but that was not the case for the California BDR stock. The model indicated that the relative spawning biomass for the California BDR is below the management target of 40%. For California scorpionfish, the model results indicated that the population size has remained above the management target throughout the period covered in the assessment.

Two Center for Independent Experts (CIE) reviewers were commissioned to participate in the stock assessment review panel and conduct an impartial and independent peer review of the stock assessments of the two species, and in accordance with the SoW and ToRs herein. One of the reviewers also acted as the “consistent” CIE reviewer and participated in all STAR panels held in 2017. Each CIE reviewer is also required to produce an independent peer review report in the format and content of which is described in Annex 1. The report should be addressing each ToR as described in Annex 2.

I was the consistent reviewer and this document provides my review of the 2017 benchmark stock assessments of yellowtail and yelloweye stocks. Further details on the reviewer’s role and the review request of the Center for Independent Experts (CIE) are presented below and in Appendix 2.

Description of the Reviewer’s Role in the Review Activities

I was contracted to:

1) Conduct necessary pre-review preparations, including the review of background material and reports provided in advance of the peer review.
2) Participate during the STAR Panel 3 review meeting in scheduled in Santa Cruz, California during the dates of July 24th -28th, 2017 as specified herein, and conduct an independent peer review in accordance with the ToRs (Annex 2).
3) No later than August 11th, 2017, submit the draft independent peer review report to the contractor. The CIE report shall be written using the format and content requirements specified in Annex 1, and address each ToR in Annex 2. (Appendix 2).

In addition to that, in my role as an active and engaged participant, I voiced concerns, suggestions, and improvements throughout the panel discussions, while respectfully interacting with other review panel members, advisors, and stock assessment technical teams.

Summary of Findings

TOR 1. Become familiar with the draft stock assessment documents, data inputs, and analytical models along with other pertinent information (e.g. previous assessments and STAR panel report when available) prior to review panel meeting.

Several documents were provided to the CIE reviewers about two weeks before the meeting for both species including:

- The draft stock assessment reports;
- The Pacific Fishery Management Council's Scientific and Statistical Committee's Terms of Reference for Stock Assessments and STAR Panel Reviews;
- Stock Synthesis (SS) Documentation; and
- Past STAR Panels reports.

Selected bibliography that became available to us either before or during the meeting is listed in Appendix 1.

I reviewed the assessment reports prior to the STAR Panel meeting and became familiar with other documents provided including the analytical model (Stock Synthesis) and the data that were used to populate the model. That process highlighted a number of questions, which formed part of my contribution to the meeting.

TOR 2. Discuss the technical merits and deficiencies of the input data and analytical methods during the open review panel meeting.

BDR

Catch and CPUEs

Four types of commercial fleets were available for the California BDR stock assessment; hook and line, net gears, trawl and "other". The catches were also split into South (meaning south of Point Conception, Santa Barbara County, California) and North. There were two sources of catch information that provided catch data for the California stock assessment for the years 1969 onward; a cooperative port sampling program (California Cooperative Groundfish Survey) that collects information about catches, including species composition data, and landing receipts often called "fish tickets" that record the weight of fish landed.

Market categories are used to record catches, and some of them might not represent a single species but a complex. The latter applies to BDR; it is often reported in the Blue rockfish market category, but can also be found in the Black rockfish market category. As BDR is not reported as an individual species (or two separate species to be exact) the catches used in the assessment come from "expanded" landings, the calculation of which used species composition data, collected by port samplers, to allocate catch weight recorded on landing receipts to species. Catches prior to 1969 came from the California Catch Reconstruction, and were available for only two gear classes; trawl and non-trawl. The assumption made was that BDR caught in the non-trawl fishery was caught with hook and line.

As with the California stock, for the Oregon stock, catches prior to 1987 were not reported by species, and therefore catches for the period before 1987 also came from estimates of proportion of BDR in rockfish catches. Catches for that period came from historical catch reconstructions for U.S. West Coast groundfish and extended back to 1892. Landings data from PacFIN were used from 1987 onwards and provided a greater detail as BDR was specifically identified for most of the catches. However, some calculations using BDR ratios were also needed for this dataset, because there were landings of rockfish for which species composition sample estimates were unavailable and could include BDR. Two types of gear were used for the Oregon commercial fishery: hook-and-line (jig, dingle bar, and cable) and longline gear.

Estimates of discard mortality in commercial fisheries for both stocks came from the West Coast Groundfish Observer Program. They were calculated using ratios of BDR discard mortality relative to the relevant species complex from the WCGOP's Groundfish Expanded Mortality Multiyear (GEMM) report. Discarding was assumed to be the same for all years and expressed as a fixed percentage of landings which was equal to 50.63% for California and 24.71% for Oregon. However, that is a simplification as the calculations showed that there was a high year to year variability in discarding. Annual estimates of commercial landings were multiplied by this ratio to calculate discard each year.

Recreational catches for the California stock came from three different sources; historic catches (1928-1980) came from reconstructed recreational rockfish catches and discards after species composition data were used to define the ratio of BDR. More recent catches came from MRFSS until 2003 and then from its replacement, CRFS. Catches were split into charter/party boats and private boats, and also into two areas, southern California and Northern California. Discards were also calculated and were treated as a separate fleet with different length composition. A ratio of 2% discarding, based on retained and dead discard data from the period from 2005-2016, was used to calculate dead discards for both the charter boat and private boat fisheries.

Three recreational fleets were used for the Oregon model: ocean-boats (Private Boat and Rental (PBR) and Commercial Passenger Fishing Vessel (CPFV) boat types), ocean-boats that discarded BDR, and shore based fishing (beach/bank and man-made structure types) including estuary-boats. Ocean-boat catches were separated into two fleets to allow the model to use different selectivities to reflect differences in the length composition data for landed BDR versus discarded BDR.

Landings from the ocean-boats fleet prior to 1978 (back to 1928) were reconstructed through extrapolation using historic annual sales of fishing licenses as an indirect measure of fishing pressure to scale catches. Although, this is a reasonable approach, annual sales is a crude metric to use to characterise pressure and therefore this is a source of uncertainty about historic pressure. During the meeting, it was indicated that sales of daily licenses could provide a more realistic picture of pressure. Daily license can be bought in California but it is not clear if such daily licenses exist in Oregon. If such information is available for the period before 1978, I would recommend that it is considered in future calculations of historic catches.

For Oregon, discarding was modelled for the ocean-boat fleet while no discarding was assumed for the shore fleet. The data in the Oregon Blue and Deacon rockfish (ORBD) database were collected by observers on charter boat trips or through dockside interviews. For the ocean-boat fleet, discards were calculated using the Oregon Recreational Boat Survey (ORBS) database for the period from 2002 to 2016 and discard rate was small (less than 3%) except for 2015 when bag limits changed. Dead discards from 1979 to 2001 were reconstructed by multiplying the estimated landed catch by a constant proportion (0.0087), which was calculated using the discard data from the period after 2002. No discarding was assumed for the period before 1979.

The ratio of male – female fish in the catches was very different with females dominating the catches, and although a number of explanations were mentioned including discarding and the effect of growth or difference in behaviour, it was not clear what process might lead to that imbalance.

Catches relied on reconstructed data some of which were at rockfish level, so assumption had to be made about the proportion of BDR to calculate the catches for this species. This is a source of uncertainty which is not captured in the results as catches are assumed to be known without error. Some sensitivity was done, but this is an area of the model that requires further examination to characterise the uncertainty and capture it into the analyses.

The CPUE indices that supported the stock assessments came from the following sources:

California

- MRFSS CPFV Dockside Recreational survey, this dataset also provided length compositions and age at length compositions that were treated as CAAL in the model.
- CRFS Private Boat Dockside Recreational survey, which also provided length compositions. Its predecessor, MRFSS, also provided a length composition.
- CDFW Onboard CPFV Observer recreational fishery survey, this was split into two segments an early one (1988 to 1998) and a recent one (2001 to 2016) to reflect changes in regulation. Length composition was utilized for the early segment only.
- NMFS SWFSC Pelagic Juvenile Rockfish trawl survey.
- CalCOFI Larval Abundance Index which covers the southern part of California only, so it was not used in the base case model.

Other length composition data not mentioned above but which were available included all commercial fisheries and recreational discards. Also, length composition data were used from two recent studies which covered only two years (2010 -2011). These data were treated as CAAL in the model.

Oregon

- Logbook data that commercial nearshore fishermen are required to submit; only data from hook and line were used to develop the index from these data. Length composition for the hook and line fishery were also available for both landed and discarded fish.
- OR onboard observer programme.

- ORBS Dockside recreational boat survey.
- MRFSS CPFV dockside sampling that reflects data collected from dockside surveys of the recreational fishery.

Length composition data were also available from an independent ODFW length-age sampling as well as from RecFin (MRFSS) and ODFW-ORBS, while age at length data from recreational ocean-boat landings were treated as CAAL in the model.

A delta GLM was used to standardise the NMFS SWFSC Pelagic Juvenile Rockfish trawl index and CalCOFI Larval Abundance Index for California and the logbook data CPUE index for Oregon. A negative binomial GLM was used to standardise all the recreational CPUE indices for both the Oregon and California stock. The Stevens-MacCall method was also used for almost all recreational fisheries to identify fish samples that could be associated with BDR before standardisation was undertaken.

The CPUE data were characterised by spatially heterogeneity, especially for the California stock and area factors or other assumptions were used in the standardisation to capture that. However, the VAST model that was used for previous assessments covered in this series of STAR panels was not used here as the STAT were not clear whether the VAST offered the parametrisation that they needed (e.g. to simulate the reef-dependent feature that their data had). The STAT indicated that further exploration would be needed before the VAST model could be applied and that was something that could not be done for this assessment due to time limitations. Previous exploration (i.e. other STAR assessments) has shown that different standardisation approaches could have an impact in the final CPUE index, and therefore, I would recommend that VAST is also explored for the next assessment, so a comparison could be made between different standardisation approaches.

The reconstruction of historic commercial catch was based on proportions of BDR sampled from mixed rockfish landings and the species recognition is very sketchy and sparse, so the landing reconstruction is characterised by uncertainty. However, there are some suggestions that fishermen might actually be avoiding blues, so the fact they are sparse might not be the result of misreporting but fishing practices. It is not clear how much uncertainty this issue adds to historic catches.

The species that the Stevens-MacCall filtering method associated with BDR in Oregon (more shelf than nearshore species) differed from those associated with BDR in California. This probably reflects the Deacon dominance in Oregon that is associated with different species from those for Blue. Current knowledge cannot ascertain whether this difference in associated species could also be used to distinguish blue and deacon catches in the future to create species-specific series. However, this is another area that merits further consideration.

Biological information

The species are characterised by gender specific biological processes; that includes growth with female fish being considered to grow slower but to bigger lengths than males. Females also mature more slowly starting at a length of about 19 cm or about 5 years, while age at first maturity seems to be about 4 years for males. It appears that recruitment is highly affected by environmental conditions especially during the planktonic stage of the recruits. Maximum age for BDR was above 30 years for both males and females.

The Hamel approach was used to calculate M for females using maximum age of 41 for the California stock and 34 for the Oregon stock. That gave an M of 0.1317 and 0.159 respectively as a point estimate. Male mortality was modelled as an offset.

Growth is assumed to be gender specific and when species-specific data were analysed, the results suggested that female Deacon had faster growth rates than Blue rockfish and grows to a larger size. However, for these analyses, the growth equation was for both species combined, but with sex-specific growth parameters which were different for each stock.

Age at maturity also seems to differ among species with the information presented suggesting that there is more than a year difference in the age at 50% maturity between the two species with Deacon Rockfish maturing at an older age, although their length at maturity is very similar. Despite these differences, the assessment used a single maturity curve for both species but it was expressed in length. They also used an exponential function to describe the relationship between fecundity and length reflecting a greater production of eggs by bigger fish.

There were two data related issues that create uncertainty, one is the limited amount of otoliths that came from California which creates an Oregon-biased sample, and the second stems from potential differences in growth and maturation of the two species which are not captured in the simulations. Additional analyses of existing data as well as collection of new data will be needed to characterise/reduce this uncertainty.

Furthermore, calculation of the length at 50% maturity for the California stock used data from the Monterey area only. However, the information presented suggested that there were additional data that could be used to inform the value of L50. However, due to time limitations, the STAT could not explore all the sources of information from California and consider any additional work that could be done to improve the estimation of that parameter. I will recommend that further analyses be done using all relevant data to estimate a maturity function for California.

Analyses of the datasets by gender highlighted the imbalance between males and females, especially at older ages leading to a female-biased dataset. It was not clear why the data collected included so fewer males, but that is another source of uncertainty and further investigation is needed to understand if it is a mortality-related effect or there is another explanation (e.g. cryptic part of the population, see also comments in the next section).

Californian scorpionfish

Catch and CPUE series

Catch series from three commercial (hook and line, which also includes fish pots and “other”, trawl, and gillnet) and three recreational fleets were produced to use as input into the model. There are two main recreational fisheries (private and party/charter), but the STAT decided to model discards from recreational fisheries as a separate fleet. For the latter, to find the catches to assign to it, a fixed discard mortality rate of 7% was used. Catches were extended back to 1916 for both commercial and recreational fisheries.

At the beginning of the review meeting, the proposed model included datasets from the following sources that were used to develop CPUE and inform length compositions:

- Recreational PR dockside sampling
- CPFV logbook
- Onboard observer discard catch
- Sanitation district sampling
- NWFSC trawl survey
- CSUN/VRG Gillnet survey
- Southern California Bight trawl survey
- Onboard observer survey for retained catch (this dataset did not provide length compositions)

A two-step delta-GLM model was used to standardise all the CPUEs listed above except the NWFSC trawl survey data series, which was standardised using a spatio-temporal delta-model implemented in an R package called VAST.

Length composition data were also available for all three commercial fisheries and from a power generating station impingement survey. Although, conditional age at length (CAAL) compositions were developed for each of the sources listed above, only the data from the NWFSC trawl survey were inputted as CAAL into the model.

Information about one of the fisheries, the party/charter recreational fishery, is available from two sources, the logbooks the captains have to submit and the records from the onboard observer survey. Although the STAT indicated that there was overlap in the time period covered, no one has tried to cross reference the two sources to test for inaccuracies or discrepancies. Such exercise could help characterise the uncertainty in those data sources better to improve the robustness of the model.

Further, the onboard observer survey series and that of the discard catch survey characterise the same fleet, but the data come from different sources (e.g. discard rates come from a subset of vessels that have observers, while total discard come from a different source that extrapolates to the total number of vessels using certain information about length composition). There was a lot of confusion during the meeting about the amount of sources of data that contributed to these CPUEs and how all that information was used/combined. Further explanation of where data come from and how they were used will improve the quality of the report.

This will be of particular importance if the party/charter fleet was to be modelled as a single fishery that produces catch and discards. The collection and recording of data at present does not facilitate such an approach, which is a more straightforward one, and instead lead to the artificial creation of two fleets in the model.

Biological information

Otoliths were used to calculate age and the maximum age in the samples used was 29 years, but only 1% of the fish samples were older than 21. Therefore, the age of 21 was used with the Hamel approach to calculate the value of M. That was M= 0.257 and that value was used for females, while the M for males was estimated as offset. The uncertainty in otolith readings was assessed by comparing readings from two different readers.

Growth is assumed to be gender specific and a linear relationship between fish weight and eggs is used to describe fecundity. The latter is an approximation as there was not a tailored study on fecundity and the STAT did not use the function included in the 2005 assessment as they did not consider it to be fit for this stock. It is not clear how accurate/appropriate the linear relationship assumption is, so this is a source of uncertainty, and therefore it is recommended that research be done to improve the knowledge of reproductive biology for this species. The 50% maturity was set at 18cm TL and the sex ratio at birth was 1:1.

Recruitment is described as a Beverton-Holt function; the value of steepness was derived from meta-analyses, and was set equal to 0.718, as there are not specific estimates for scorpion fish.

TOR 3. Evaluate model assumptions, estimates, and major sources of uncertainty.

Both assessments used the length- and age-structured modelling software Stock Synthesis. For BDR, the base model assumed two independent stocks (OR, CA), and the CA base case model excludes the area south of Point Conception (Santa Barbara County, California). In that sense, this is the same area that was used in the previous assessment for the California stock. For California scorpionfish, the model assumes a single population in the area south of Pt. Conception.

The models used data on landings and discards, CPUEs, length- and age-composition data, and length specific maturity and fecundity. They also used the Beverton-Holt stock-recruitment relationship to link spawning potential to recruits and allowed the model to calculate deviations from the B-H calculated values. Selectivity functions including time blocking were used to characterise the behaviour of the fisheries over the years.

BDR

The models for both BDR stocks (California, Oregon) simulated a sex-disaggregated population dynamics starting from 1892 for the Oregon stock and 1900 for California, and assumed that the stocks before that were at unexploited conditions.

The model treated discarded fish separately from the catches of the fleets that produced them and they were simulated as a separate fleet both for commercial and recreational catches. This approach was adopted for both BDR and Californian scorpionfish (see also section below), but it is questionable as it is not clear what effect it has on the model results, and therefore, the STAT was asked to undertake further analyses to explore that.

California stock

The model started in 1900, but catches were available only from 1916 onwards, so a linear interpolation was used to construct catches for the years before 1916 and were assigned to the hook and line fishery. The recreational sector included four fleets covering fishing type (CPFV or private boat) and catch type (retained or discarded). Four fleets were also used for the commercial fishery; a hook-and-line and longline gear type, a net gear type, ‘other’ gears (including trawl), and a fleet for commercial BDR discards. Fleet selectivity was assumed to be asymptotic for all retained catch fleets, and dome shaped for discard fleets. Time blocks were used to capture changes in peak selectivity associated with bag limit changes in 1971 (CPFV) and 2000 (CPFV and private boat).

The original base case model used a fixed value for the stock-recruitment steepness, which was equal to 0.718. Fecundity and weight at length parameters as well as the parameters for the maturity function were also fixed. Recruitment deviations were estimated from 1950 – 2015. Natural mortality was estimated for females, and a prior distribution was used to describe plausible values, while mortality for males was estimated as an offset. The final base case model estimated steepness and used a prior as an input.

Two data points from the juvenile recruitment index were also removed when the series was inputted into the model; this was because their value had very high CV. This is of concern, as it reduces the information that this index provides and the Panel requested additional analyses to rectify that (see section 7).

Although the base case model assumed a gender combined selectivity, an additional parameter was introduced to allow for only part of the male population to be available to fisheries. This was used to test the model fit under different assumptions about the value of that parameter. The model results from those sensitivity runs (i.e. when maximum selectivity for males was allowed to go below 1) suggested that the model supported the assumption of a cryptic population of males (reduces selectivity to about 50%). It is of concern that the model needs to create that cryptic population behaviour to explain the data.

Oregon stock

This is the first full assessment for the Oregon BDR, so the STAT considered the configuration of the 2007 and 2017 CA assessments and adjusted the parametrization to reflect knowledge about the stock in Oregon.

The model is a single stock, sex disaggregated model covering the Oregon waters. The model used five fleets to track both recreational and commercial catches. Fleet selectivity was asymptotic for the recreational ocean landings fleet and the commercial landing fleet and dome-shaped for the commercial and recreational discard fleets and the shore fleet. The model relied mainly on fishery data and made use of a small set of length at age data that were available.

The values of natural mortality chosen for this stock differed from those used for the California assessment. The median of the prior for M was originally set to 0.16 for female and the M for male was calculated as an offset, although the final base case model used the median of the Hamel prior for males as well as females. The values of M were higher than used for California, and although the reason for the higher mortality is not clear, one possibility might be that the data that informed this calculation for M in Oregon came from more recent data than those for California. For Oregon, all aging data came from the period from 1999 with the majority coming from 2008.

Parameters that were also fixed included those of the maturity curve, weight at length, and fecundity. Recruitment deviations were estimated for the period from 1970 to 2015.

Sensitivity analyses showed that the model is more sensitive to values of natural mortality, deviations of the recruitment from that found with the B-H equation that were allowed and the method used to tune the model. The model was also sensitive to the removal of the commercial composition data. Likelihood profiles also indicated that the age and length composition data were driving the model while the value of M offset for males was also very influential.

The model did converge with the original parametrization, but the STAT decided to fix the values of M at the median of the prior calculated using the Hamel method and that was because they believed that the model did not provide a well-defined estimate for Ro with the original configuration.

Californian scorpionfish

The model assumed that there was only one stock and used gender specific parameters to simulate the dynamics of the population. The model started in 1916 and assumed that the stock was at unfished equilibrium before that. The basecase model also makes the following assumptions:

- Steepness is a fixed parameter and equal to 0.718.
- M was fixed for females, and for males it was calculated as an offset in the pre-STAR model but was set equal to the female M for the post-STAR basecase model. M was set equal to 0.235.
- The parameters for weight at length and maturity and fecundity at length functions are also fixed.

The model estimated recruitment deviations only for the period from 1965 to 2016.

The value for steepness used for the calculations came from meta-analyses conducted for rockfish, and therefore, it is not necessarily applicable to scorpionfish. However, given lack of any other data, that was considered to be the best option. This is another source of uncertainty and further work to develop a prior for steepness for this species is recommended.

Catches were assumed to be known without uncertainty and selectivity curves were used to describe the exploitation pattern of each fleet. Data on catches from the area to the South of Point Conception were also available, but they were not included for the basecase. However, a sensitivity runs was done, which included those additional data to respond to concerns about the status of the fish to the south of that Point that have been expressed at previous meetings. Although there are catches of this species in Mexican waters, those are excluded from the calculations.

The model is allowed to estimate selectivity for each fleet except in the cases in which the STAT felt there were not enough data for the model to estimate it. The latter category included the net commercial fisheries, which were set to mirror the commercial hook-and-line fishery and the gillnet survey (fishery independent), which was configured to mirror the selectivity of the Publicly Owned Treatment Works (POTWs) Monitoring Trawl Survey. However, there were noticeable differences in the length compositions of these fleets which did not support that assumption for either of the fisheries. This was one of the features of the model that was changed during the Panel review and the new configuration (no mirroring) provides a more realistic picture of the fleet. However, the gillnet survey was eventually dropped from the final basecase model as it created problems with model convergence and its exclusion did not affect the model results.

The model created two fleets for Ocean-boat fishery to reflect differences in the length composition data for landed BDR and those BDR discarded, which is an artificial separation of the fleet and raised questions about consistency between the dynamic of the two simulated components of this fishery. Although there was not enough time during the review meeting to explore this in detail, creating a single fishery that actually represents the total selectivity of the gear (and possible using a retention curve) will avoid such issues.

The latest model is much different from the model used in 2005 which was also in an older version of SS; however, the STAT attempted to reproduce the results and got close to the original outcomes but identified an error in the process. In particular, the harvest rate hit the boundaries for the recreational fleet and not all of the recreational catch was removed from the model. It was not possible to transform the SS v1.8 version to the SS3.24, so a number of intermediate steps were made to produce the new version of SS.

TOR 4. Provide constructive suggestions for current improvements if technical deficiencies or major sources of uncertainty are identified.

The issues identified above were explored during the review meeting and suggestions for improvements or testing of alternative options were recommended for both species. So, in terms of immediate improvements, those would be for the STAT to capture the changes identified during the meeting. A couple of points are also listed below.

Although not necessarily a deficiency, it will be very useful if the modelling framework could produce posterior pdfs for the estimated parameters and other key parameters, and provide plots that show the prior and posterior on the same graph to show how the prior changes.

For California scorpionfish, there was a lot of confusion during the meeting about the amount of sources of data that contributed to CPUEs that came from onboard observer survey series and corresponding discard catch survey, and how all that information was used/combined. Further explanation of where the data came from and how they were used will improve the quality of the report.

Also, likelihood profiles suggested that the length composition data for California scorpionfish are pointing to values for M that are unrealistic ($M > 0.35$) and data from the impingement survey seemed to drive that trend. Given such important influence, it will be useful if more details/exploration especially focusing on the representativeness of this dataset could be added into the report.

TOR 5. Determine whether the science reviewed is considered to be the best scientific information available.

Both teams looked to incorporate knowledge from several sources to inform the models and used a highly sophisticated model for their stock assessment.

On the data side, the input to the model represented the current state of knowledge about those species, and therefore it represents the best information available. As with the majority of the species assessed in this set of STAR Panel meetings, there is still considerable uncertainty in the model results which might not necessarily be reflected in the uncertainty boundaries of the model results. This is because many important parameters are fixed, and therefore their uncertainty was not incorporated into the outputs. The STAT ran sensitivity analyses to describe that additional uncertainty, and to inform the selection of axis of uncertainty for the decision tables.

Overall, the assessments represent the best information currently available and can support management.

TOR 6. When possible, provide specific suggestions for future improvements in any relevant aspects of data collection and treatment, modeling approaches and technical issues, differentiating between the short-term and longer-term time frame.

BDR

Short-term

Additional analyses requested during the review meeting indicated that the introduction of MPAs might have affected the values of fishery-dependent CPUEs for California. An updated CPUE index was created to exclude areas that were established as MPAs, but it was not possible to adjust length compositions for the corresponding fisheries during the time available. It is recommended that this adjustment be also done to maintain consistency in the data used in the model.

Longer-term

Despite common features, there are differences in the biology and dynamics of Blue and Deacon rockfish, and therefore, further work is needed to identify ways to produce species-specific data to support single species stock assessment both from reanalysing historic data but also tailoring future data collection.

None of the surveys from California sample for length and ages, so it is not possible to produce gender specific CPUEs and explore what the female-biased catches might do to the stock gender-wise. Therefore, there is merit in developing gender specific data collection programmes.

New research presented during the meeting that used cameras off Oregon to provide information of BDR density relative to other species could provide a fishery independent source of relative abundance information. Therefore, this is another area in which further work to assess the potential of such approach will be of value.

Discussions during the review meeting indicated that the pelagic juvenile rockfish index will be able to differentiate between the two BDR species using genetic analyses, so it will be useful to develop a species-specific index going forward.

There is limited fishery-independent data for both species, and that is a weakness of the model, so data collection schemes to address this gap will strengthen future stock assessments.

California scorpionfish

Short-term

During the meeting, it was indicated that the CalCOFI has data for Scorpion fish eggs, but apparently when they were inputted into the system they were categorised as Scorpidae, so the level of species-specific detail on eggs abundance in the hard copy is lost. It is recommended that those data for the specific species that are in the hard copies be digitised as well and captured in the electronic database.

Given that the distribution of this species extends beyond the US borders, it is important that exploitation and status of the stocks in the Mexican water are monitored and future assessments look to incorporate catches from Mexico.

Longer-term

There is limited information about maturity and fecundity for California scorpionfish and that is an important element of the model, so research in this area is recommended.

The value for steepness used for the calculations came from meta-analyses conducted for rockfish, and therefore, it is not necessarily applicable to scorpionfish. Thus, further work to develop a prior for steepness for this species is recommended.

TOR 7. Provide a brief description on panel review proceedings highlighting pertinent discussions, issues, effectiveness, and recommendations.

California BDR

The STAT presented the recommended model and indicated that a small omission of hook and line landings from the model proposed in their report has been corrected and presented the updated results that confirm that the model outputs had not changed.

Following that, the Panel requested sensitivity runs to test the results when the start year for estimating recruitment deviations changes (e.g. ±10 yrs. and ±20 yrs.) from the base case. Also, the STAT were asked to drop data components coming from the CPFV and private fleets (i.e., indices, length comps, and age comps) to see how each of them affect the trend in recruitment. The model was relatively insensitive to earlier starts of the recruitment deviations, but led to much different results when recruitment deviations started later. The second request (drop data) highlighted that the stock status in 2017 was sensitive to four data sources even though unfished biomass was relatively stable:

- Schmidt age and length data
- MRFSS private boat length compositions
- MRFSS CPFV index
- 1988-1998 onboard CPFV observer index

The model indicated that the Schmidt data are mainly the ones that are supporting the recovery of the population in recent years. When that length and age data were removed, the population continued to decline with no increase in recent years although the model was unstable. These is a considerable effect, especially if one considers that the Schmidt data include information for only two years.

Panel requests also aimed to explore the impact of the choice of the thresholds in the Stephens-MacCall filtering, and the decision to model landings and discards as separate fleets. Sensitivity analyses showed that those choices influence the model results but only marginally.

The Panel also asked the team to check if the MPAs were resulting in higher CPUE values during the period they were not yet closed, so when they were closed, the CPUE might have dropped not because the population changed but because the sampling from inside the MPA did not occur anymore. The Panel agreed with the

STATs suggestions to remove the samples taken from inside MPAs and recreate the CPUE. However, one thing the STAT could not do is to adjust the length composition in case the length comp from the MPAs differs from the composition coming from the rest of the areas. The adjusted CPUE was almost identical to the original one, and therefore the stock assessment results did not change when the adjusted CPUE was used in the SS model. The Panel agreed that this adjusted CPUE is the best to use in the baseline model even if the results did not change.

The Panel agreed that the model with those changes represented an improvement from the original base case model, and those were included in the updated base case model. The specific changes were as follows:

- Estimation of h and M with the priors included;
- Inclusion of the revised juvenile rockfish time series;
- Correction of the gap in the hook-and-line catch time series;

Additional requests focused on exploring the dimensions and boundaries for the axis of uncertainty and involved running the updated base case model for different combinations of natural mortality and steepness values.

Comparison with the 2007 spawning biomass graph showed that the 2007 model also produced a steep increase in the last three years, but the new model show that the increase was not there. The new model also shows a steep increase in the last two years or so. The STAT was asked to produce squid graphs for the updated assessment report to show how the strength of different recruitment years changes as new data are added, and check if some of these year classes that looked strong might become smaller once more years are added.

The final part of the requests was about jittering runs and deciding the axis of uncertainty to use to construct the decision matrix. The STAT used the SSB estimate in 2017 to characterize uncertainty in model projection by calculating the 12.5 and 87.5 percentiles from that estimate assuming a normal distribution.

Oregon BDR

The STAT presented the model recommended as a base case and confirmed that some additional work was completed before the review meeting. They also presented the results of the analyses using the proposed base case model. During the meeting, the Panel also heard about a fishery independent survey off Oregon that uses cameras to identify/map and ascertain the size of the stock. The ROV encounters of BDR provide information of BDR density relative to other species that are found in the same area. They have used Black rockfish to scale the density of BDR.

The presentation provided details of the analyses and suggested that the absolute population of BDR might be much bigger than the stock assessment estimates. This was a new area of research which aimed to test a range of processes from distribution and species composition of schools to catchability and use survey results to develop estimates of absolute abundance.

The Panel discussed the implications of these work recognising that this new type of information needed to be reviewed/tested as required to comply with standards of data used in the stock assessment. As a result, the Panel decided to form a sensitivity run that would reflect these anecdotal estimates; the run included a proxy survey with absolute abundance in numbers for one year which was the final year. The STAT was requested to run that new sensitive analyses using values of that absolute abundance ranging from the current ending estimate of numbers of fish to the ending estimate of numbers of fish in the 2015 black rockfish assessment. The model results changed considerably depending on the value used for the proxy survey. Some further exploration was done along these lines including additional analyses to compare black rockfish and blue/deacon rockfish indices for Oregon using on-board observer data and information about suitable habitat. The outcome of the latter analyses (ratio of BDR to black) was multiplied by the biomass of black rockfish and was used as a proxy survey for the model. This produced a stock that was slightly smaller than that from the updated base case. A prior for ln(R0) similar to the posterior estimated for black rockfish in the 2015 assessment, but less informative was also used as an input to the model and the results indicated that the BDR data supported values at the lower range covered by the prior. All these runs provided a useful insight into the effect that such information could have on the model results.

The Panel also requested some changes in the configuration of the base case model, including starting the linear ramp for recreational catches earlier and reducing the compression age bin down to 25 years. Those did not have much influence on model results, but the former was considered to be more realistic. A run in which the length plus bin was compressed to 42 cm did lead to some changes including improved length composition residual patterns.

Other changes tested included:

- Setting the coefficient of variation for the length at maximum age for the male growth curve to the value calculated in the California assessment. This moved away from the fixed value that was used for that parameter in the basecase model. This change led to a small change on its own, but when combined with a compressed length plus bin of 46 cm produced better residual patterns for commercial fishery length composition and recreational ocean fishery length composition. Both the STAT and the Panel agreed to include these changes in a new base case.

- Testing different values for natural mortality assuming it is fixed. The latter was proposed because sensitivity runs indicated that the model might not be able to estimate natural mortality. Following these sensitivity runs, STAT indicated that there were in favour of using the median of the Hamel prior. The argument was that there was not much information in the input data to help the model produce a robust estimate of natural mortality. However, the model did estimate M providing an indication for the values of M that the model favoured as well as the uncertainty characterising that estimate. Although the Panel accepted that change, it was pointed out that the uncertainty in the Hamel prior was smaller than that of the posterior for M that the model calculated.
- Presenting total biomass estimates instead of spawning biomass for different values of the parameter that reduces selectivity for males (apical parameter). The results showed that there is small change in the stock size and status for a wide range of apical values down to 0.3 with bigger changes after that. This was relevant to sensitivity runs only as the base case model did not use this parameter (it was set equal to 1).

Runs without any indices showed that the CPUE indices had very little influence on the results. Also, the selectivity for the survey was set to one as it was mis-specified in the original model, and that led to a small change in the stock depletion. Following these additional explorations, the STAT arrived at an updated base case model that included the following changes:

- The CV of the male length at maximum age set equal to that from the California blue/deacon assessment;
- The length plus bin was compressed at 46 cm;
- The selectivity of the research survey was set equal to 1 for all ages and lengths;
- Male and female natural mortality was set equal to the median of the Hamel prior distribution;

The following formula was considered as a way to define the envelope of uncertainty using R0:

±1.15 * the asymptotic SE of ln(R0) to the value of ln(R0) for the base case.

The SE normally comes from the uncertainty in the updated model estimated for ln(R0). However, the boundaries calculated did not encompass the mean value of the ln(R0) when the updated base case model is allowed to estimate natural mortality (ln(R0) = 6.641) instead of fixing it to the median of the Hamel prior. This was of concern as it suggested that those boundaries might not be wide enough to adequately represent uncertainty. To address that the SE of ln(R0) from the model that did not fix the value of natural mortality (which was greater than the one from the updated base case model) was used to calculate the envelope of uncertainty.

The Panel agreed with all the changes and the final part of the discussions focused on defining different scenarios of future catches that the STAT could use in their projections.

Scorpionfish

The STAT presented the pre-STAR model and the main results from the calculations and a series of sensitivities they had already prepared. The Panel identified changes they wanted to see in the model and made requests for additional runs. That included adding time blocks in the selectivity for recreational dead discards and testing the effect of alternative assumption about fecundity and the threshold for the Stephens-MacCall filtering.

The first request led to a change in the base case model to include the additional blocking, while the rest of the tests indicated that the results are sensitive to the choice of the fecundity function and the threshold for the Stephens-MacCall method. However, because there was not information to support one choice over another, no changes were made for fecundity and the threshold. However, this highlighted an area in which more research is required.

Another request was made for combining the retained and discarded fish into a single recreational index. This was because the STAR Panel was concerned with modeling discards as a separate fleet. This was proven to be difficult to achieve, so this analysis was not completed. However, concerns remained about splitting individual fleets into two.

Also, there were questions about the selectivity for some series (impingement, PacFin) and the fact that the model did not reproduce length comps per year very well. The STAT was asked to estimate them instead of using selectivity from other fisheries. The length residuals improved with that change and the updated selectivity curves did produce a small change in the stock status. Additional time blocks for selectivity were also explored, and the final model included time blocks for selectivity for all commercial fleets.

The STAT also explored the possibility of recruitment deviations being linked to temperature. To do so, they plotted the CalCOFI sea surface temperature index for Pacific sardine with the estimated California scorpionfish recruitment deviations. Based on the results, the two seemed to have similar trends. Therefore, further work is strongly recommended to refine this analysis and explore the possible links between recruitment and environmental parameters.

Another run in which recruitment deviations would not be estimated was also requested to test the impact of that feature of the model and the results were very different, but the model fit was not as good as with estimated recruitment deviations. Therefore, no changes were recommended.

Following these additional runs, the STAT recommended the following changes to the original model:

- Model the commercial net fishery with its own selectivity curve with two selectivity blocks matching the other commercial fisheries. Peak selectivity parameter needs to be fixed (not estimated);
- Model the impingement data with a descending selectivity pattern, including estimation of the peak parameter;
- Drop the gillnet survey from the model;
- Fix M for both sexes combined based on a max. age of 23 years (M = 0.235) (determined by averaging the third oldest estimated ages of each sex);

Natural mortality was used to define the axis of uncertainty; and different approaches were considered to find the appropriate boundaries to use for calculations for the decision table. The final values agreed were M = 0.2745 and M = 0.164. The last part of the meeting focused on developing a decision table for different catch streams.

Conclusions/Recommendations

The 2017 Benchmark stock assessments for the combined Blue and Deacon rockfish (BDR) and California scorpionfish took place in Santa Cruz, California, between July 24th and July 28th, 2017. The focus of the review was on the two stocks of Blue and Deacon rockfish off California and Oregon, and one stock of California scorpionfish found off southern California.

Both species were assessed using a length- and age-structured modelling software called Stock Synthesis, which also allows for age and length composition data to be incorporated into the analyses. Both fishery dependent and fishery independent data were used to run the model and sensitivity runs were conducted to characterise uncertainty. Additional runs were also requested by the Panel to explore aspects of the assessment model.

As a result of the latter, the original models were modified to reflect corrections and modifications identified during the review meeting and the final, updated models reflect the best scientific information for these stocks.

The model results showed that the current stock size for the Oregon stock is well above management targets, but that was not the case for the California BDR stock. The model indicated that the relative spawning biomass for the California BDR is below the management target of 40%. For California scorpionfish, the model results indicated that the population size has remained above the management target throughout the period covered in the assessment.

A list of the recommendations made under each of the ToR above are summarised below:

Recommendation 1 BDR: Catches relied on reconstructed data some of which were at rockfish level, so assumption had to be made about the proportion of BDR to calculate the catches for this species. This is a source of uncertainty and although some sensitivity analyses were done, this is an area of the model that requires further examination to characterise the uncertainty and capture it into the analyses.

Recommendation 2 BDR: Further work is needed to identify ways to produce species specific data to support single species stock assessment both from reanalysing historic data but also optimising future data collection.

Recommendation 3 BDR: There are limited fishery-independent data for both species and that is a weakness of the model, so data collection schemes to address this gap will strengthen future stock assessments.

Recommendation 4: BDR: Previous exploration (i.e. previous STAR assessments) has shown that different standardisation approaches could have an impact in the final CPUE index, and therefore, I would recommend that VAST be also explored for the next assessment, so a comparison could be made between different standardisation approaches.

Recommendation 5: BDR: Current knowledge cannot ascertain whether the difference in species associated with BDF on Oregon and California could also be used to distinguish blue and deacon catches in the future to create species specific series. However, this is another area that merits further consideration.

Recommendation 6: BDR: There were two data related issues that create uncertainty, one is the limited amount of otoliths that came from California which creates an Oregon-biased sample, and the second stems from potential differences in growth and maturation of the two species which are not captured in the simulations. Additional analyses of existing data as well as collection of new data will be needed to characterise/reduce this uncertainty.

Recommendation 7: BDR: Imbalance between males and females, especially at older ages, has led to a female-biased dataset. It was not clear why the data collected included so fewer males but that is another source of uncertainty, and further investigation is needed to understand if it is a mortality-related effect or there is another explanation (e.g. cryptic part of the population).

Recommendation 8: BDR: The values of M for Oregon BDR were higher than those used for California and although the reason for the higher mortality is not clear, one possibility might be that the data that informed this calculation for M in Oregon came from more recent data than those for California. It is recommended that further work be done to explore the factors that might have contributed to this difference.

Recommendation 9: California BDR: calculation of the length at 50% maturity for the California stock used data from the Monterey area only. However, the information presented suggested that there were additional data that could be used to inform the value of L50. I would recommend that further analyses be done using all relevant data to estimate a maturity function for California.

Recommendation 10: California BDR: An updated CPUE index was created for California BDR to exclude areas that were established as MPAs, but it was not possible to adjust length compositions for the corresponding fisheries during the time available. It is recommended that this adjustment also be done to maintain consistency in the data used in the model.

Recommendation 11: California BDR: None of the surveys from California sample for length and ages, so it is not possible to produce gender specific CPUEs and explore what this female-biased catches might do to the stock gender-wise. Therefore, there is merit in developing gender specific data collection.

Recommendation 12: Oregon BDR: Landings from the ocean-boats fleet prior to 1978 were reconstructed through extrapolation using historic annual sales of fishing licenses as an indirect measure of fishing pressure to scale catches. However, annual sales is a crude unit to use to characterise pressure. During the meeting, it was indicated that sales of daily licenses could provide a more realistic picture of pressure. Daily licenses can be bought in California, but it is not clear if such daily licenses exist in Oregon. If such information is available for the period before 1978, I would recommend that it is considered in future calculations of historic catches.

Recommendation 13: Oregon BDR: The value for steepness used for the calculations came from meta-analyses conducted for rockfish, and therefore, it is not necessarily applicable to scorpionfish. This is another source of uncertainty and further work to develop a prior for steepness for this species is recommended.

Recommendation 14: Oregon BDR**:** New research presented during the meeting that uses camera off Oregon to provide information of BDR density relative to other species could provide a fishery independent source of relative abundance information. Therefore, this is another area in which further work to assess the potential of such approach will be of value.

Recommendation 15: California scorpionfish: There is limited information about maturity and fecundity for California scorpionfish and that is an important element of the model, so research in this area is recommended.

Recommendation 16: California scorpionfish: Information about one of the fisheries, the party/charter recreational fishery, is available from two sources: (1) the logbooks the captains have to submit, and (2) the records from the onboard observer survey. Although the STAT indicated that there was overlap in the time period covered, no one has tried to cross reference the two sources to test for inaccuracies or discrepancies. Such exercise could help characterise the uncertainty in those data sources better to improve the robustness of the model.

Recommendation 17: California scorpionfish: There was a lot of confusion during the meeting about the amount of sources of data that contributed to CPUEs that came from onboard observer survey series and corresponding discard catch survey, and how all that information was used/combined. Further explanation of where data came from and how they were used will improve the quality of the report.

Recommendation 18: California scorpionfish: The collection and recording of data for discard and catches of the party/charter fleet does not facilitate its simulation as a single fishery that produces catch and discards, which is a more straightforward one and instead, lead to the artificial creation of two fleets in the model. The impact of this set up was not clear and needs to be revisited to explore it and guide adjustments in data collection if needed.

Recommendation 19: California Scorpionfish: Fecundity is simulated by a linear relationship between fish weight and eggs, but that assumption is not based on any species-specific data as there was not a tailored study on fecundity. It is not clear how accurate/appropriate this linear relationship assumption is, so this is a source of uncertainty and therefore, it is recommended that research be done to improve the knowledge of reproductive biology for this species.

Recommendation 20: California Scorpionfish: The distribution of this species extends beyond the US borders, but catches from Mexico were not included in the assessment. It is important that exploitation and status of the stocks in the Mexican water be monitored and future assessments look to incorporate catches from Mexico.

Recommendation 21: California Scorpionfish: During the meeting, it was indicated that the CalCOFI has data for scorpionfish eggs, but the level of species-specific detail on eggs abundance is not included in the database. It is recommended that those data for the specific species that are in the hard copies be digitised and captured in the electronic database.

Recommendation 22: California Scorpionfish: Further work to refine the analyses started during the meeting and explore the possible links between recruitment and environmental parameters is strongly recommended.

Appendix 1: Bibliography

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Draft California and Oregon BDR Assessment, associated model files and supplementary Tables.

Draft California Scorpionfish Assessment and associated model files.

A number of past CIE and STAR reports for the species assessed were also made available.

Appendix 2. Statement of Work for Dr Panagiota Apostolaki

External Independent Peer Review by the Center for Independent Experts

Stock Assessment Review (STAR) Panel 3

Background

The National Marine Fisheries Service (NMFS) is mandated by the Magnuson-Stevens Fishery Conservation and Management Act, Endangered Species Act, and Marine Mammal Protection Act to conserve, protect, and manage our nation's marine living resources based upon the best scientific information available (BSIA). NMFS science products, including scientific advice, are often controversial and may require timely scientific peer reviews that are strictly independent of all outside influences. A formal external process for independent expert reviews of the agency's scientific products and programs ensures their credibility. Therefore, external scientific peer reviews have been and continue to be essential to strengthening scientific quality assurance for fishery conservation and management actions.

Scientific peer review is defined as the organized review process where one or more qualified experts review scientific information to ensure quality and credibility. These expert(s) must conduct their peer review impartially, objectively, and without conflicts of interest. Each reviewer must also be independent from the development of the science, without influence from any position that the agency or constituent groups may have. Furthermore, the Office of Management and Budget (OMB), authorized by the Information Quality Act, requires all federal agencies to conduct peer reviews of highly influential and controversial science before dissemination, and that peer reviewers must be deemed qualified based on the OMB Peer Review Bulletin standards.
(http://www.cio.noaa.gov/services_programs/pdfs/OMB_Peer_Review_Bulletin_m05-03.pdf).
Further information on the CIE program may be obtained from www.ciereviews.org.

Project Description:

The National Marine Fisheries Service and the Pacific Fishery Management Council will hold stock assessment review (STAR) panels in 2017 to evaluate and review benchmark assessments of Pacific coast groundfish stocks. The goals and objectives of the groundfish STAR process are to:

1) ensure that stock assessments represent the best available scientific information and facilitate the use of this information by the Council to adopt OFLs, ABCs, ACLs, (HGs), and ACTs;
2) meet the mandates of the Magnuson-Stevens Fisheries Conservation and Management Act (MSA) and other legal requirements;
3) follow a detailed calendar and fulfill explicit responsibilities for all participants to produce required reports and outcomes;
4) provide an independent external review of stock assessments;
5) increase understanding and acceptance of stock assessments and peer reviews by all members of the Council family;
6) identify research needed to improve assessments, reviews, and fishery management in the future; and
7) use assessment and review resources effectively and efficiently.

Fish that were previously identified as blue rockfish have recently been determined to consist of two species: blue and deacon rockfish. Because there is no way to separate the historical ‘blue rockfish’ landings and they seem to have similar growth rates, these two stocks are being assessed as one. Blue/deacon rockfish are highly-valued by recreational fishermen, and rank among the 5 most important recreationally-caught groundfish in both Oregon and California. Blue rockfish (including deacon) was last assessed in 2007.

California scorpionfish is an important groundfish species for near-shore commercial and recreational fleets in southern California, as well as non-extractive uses such as *in situ* viewing (e.g. diving). Total catches have reached near the OFL over the past few years with the average percent attainment of the OFL (e.g. catch/OFL) of 95%. The stock was last assessed in 2005 using Stock Synthesis 2, and OFLs/ACLs have been set based on a constant catch until a new assessment can be conducted.

These assessments will provide the basis for the management of the blue/deacon rockfish and California scorpionfish stocks off the West Coast of the U.S., including providing the scientific basis for setting OFLs and ABCs as mandated by the Magnuson-Stevens Act. The technical review will take place during a formal, public, multiple-day meeting of fishery stock assessment experts. Participation of external, independent reviewer is an essential part of the review process. The Terms of Reference (ToRs) of the peer review are attached in **Annex 2**. The tentative agenda of the panel review meeting is attached in **Annex 3**.

Requirements for CIE Reviewers
NMFS requires two CIE reviewers to participate in the stock assessment review panel. One CIE reviewer shall conduct an impartial and independent peer review of the assessments described above and in accordance with the SoW and ToRs herein. Additionally, a second “consistent” CIE reviewer will participate in all STAR panels held in 2017 and the SOW and ToRs for the “consistent” CIE reviewer are included in a separate SoW (See **Attachment A**).

Both CIE reviewers shall be active and engaged participants throughout panel discussions and able to voice concerns, suggestions, and improvements while respectfully interacting with other review panel members, advisors, and stock assessment technical teams. The CIE reviewers shall have excellent communication skills in addition to working knowledge and recent experience in fish population dynamics, with experience in the integrated analysis modeling approach, using age- and size-structured models, use of Markov Chain Monte Carlo (MCMC) to develop confidence intervals, and use of Generalized Linear Models in stock assessment models.

Statement of Tasks
The CIE reviewers shall complete the following tasks in accordance with the SoW and Schedule of Milestones and Deliverables herein.

<u>Pre-review Background Documents</u>: At least two weeks before the peer review, the contractor will send (by electronic mail or make available at an FTP site) to the CIE reviewers the necessary background information and reports for the peer review. CIE reviewers are responsible only for the pre-review documents that are delivered to the reviewer in accordance to the SoW scheduled deadlines specified herein. The CIE reviewers shall read all documents in preparation for the peer review.

Documents to be provided to the CIE reviewers prior to the STAR Panel meeting include:

- The current draft stock assessment reports;

- The Pacific Fishery Management Council's Scientific and Statistical Committee's Terms of Reference for Stock Assessments and STAR Panel Reviews;
- Stock Synthesis (SS) Documentation
- Additional supporting documents as available.
- An electronic copy of the data, the parameters, and the model used for the assessments (if requested by reviewer).

Panel Review Meeting: Each CIE reviewer shall conduct the independent peer review in accordance with the SoW and ToRs, and shall not serve in any other role unless specified herein. Each CIE reviewer shall actively participate in a professional and respectful manner as a member of the meeting review panel, and their peer review tasks shall be focused on the ToRs as specified herein.

Contract Deliverables - Independent CIE Peer Review Reports: The CIE reviewers shall complete an independent peer review report in accordance with the SoW. Each CIE reviewer shall complete the independent peer review according to required format and content as described in **Annex 1**. Each CIE reviewer shall complete the independent peer review addressing each ToR as described in **Annex 2**.

Other Tasks – Contribution to Summary Report: The CIE reviewers may assist the Chair of the panel review meeting with contributions to the Summary Report, based on the terms of reference of the review. The CIE reviewer are not required to reach a consensus, and should provide a brief summary of each reviewer's views on the summary of findings and conclusions reached by the review panel in accordance with the ToRs.

Timeline for CIE Reviewers
The following chronological list of tasks shall be completed by each CIE reviewer in a timely manner as specified in the **Schedule of Milestones and Deliverables**.

4) Conduct necessary pre-review preparations, including the review of background material and reports provided in advance of the peer review.
5) Participate during the STAR Panel review meeting **scheduled in Santa Cruz, California during the dates of July 24-28, 2017** as specified herein, and conduct an independent peer review in accordance with the ToRs (**Annex 2**).
6) No later than August 11, 2017, the CIE reviewer shall submit their independent peer review report to the contractor. The CIE report shall be written using the format and content requirements specified in **Annex 1**, and address each ToR in **Annex 2**.

Foreign National Security Clearance
When reviewers participate during a panel review meeting at a government facility, the NMFS Project Contact is responsible for obtaining the Foreign National Security Clearance approval for reviewers who are non-US citizens. For this reason, the reviewers shall provide requested information (e.g., first and last name, contact information, gender, birth date, passport number, country of passport, travel dates, country of citizenship, country of current residence, and home country) to the NMFS Project Contact for the purpose of their security clearance, and this information shall be submitted at least 30 days before the peer review in accordance with the NOAA Deemed Export Technology Control Program NAO 207-12 regulations available at the Deemed Exports NAO website: http://deemedexports.noaa.gov/ and http://deemedexports.noaa.gov/compliance_access_control_procedures/noaa-foreign-national-registration-system.html. The contractor is required to use all appropriate methods to safeguard Personally Identifiable Information (PII).

Place of Performance
For the **STAR panel 3** review, each CIE reviewer shall conduct an independent peer review during the panel review meeting scheduled in **Santa Cruz, California during the dates of July 24-28, 2017**.

Period of Performance
The period of performance shall be from the time of the award through September 15, 2017. Each reviewer's duties shall not exceed 14 days to complete all required tasks.

Schedule of Milestones and Deliverables
The contractor shall complete the tasks and deliverables described in this SoW in accordance with the following schedule.

June 19, 2017	Contractor selects and confirms reviewers
July 10, 2017	Contractor provides pre-review documents to the reviewers
July 24-28, 2017	Each reviewer participates and conducts an independent peer review during the panel review meeting
August 11, 2017	Contractor receives draft reports
August 22, 2017	Contractor submits final reports to the Government

Applicable Performance Standards
The acceptance of the contract deliverables shall be based on three performance standards:
(1) The reports shall be completed in accordance with the required formatting and content in **Annex 1**; (2) The reports shall address each ToR as specified **Annex 2**; and (3) The reports shall be delivered as specified in the schedule of milestones and deliverables.

Travel
All travel expenses shall be reimbursable in accordance with Federal Travel Regulations (http://www.gsa.gov/portal/content/104790). International travel is authorized for this contract. Travel is not to exceed $7,700.

Restricted or Limited Use of Data
The contractors may be required to sign and adhere to a non-disclosure agreement.
NMFS Project Contacts
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2032 SE OSU Drive
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2725 Montlake Blvd. E,

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Annex 1: Format and Contents of CIE Independent Peer Review Report

1. The CIE independent report shall be prefaced with an Executive Summary providing a concise summary of the findings and recommendations, and specify whether the science reviewed is the best scientific information available.

2. The main body of the reviewer report shall consist of a Background, Description of the Individual Reviewer's Role in the Review Activities, Summary of Findings for each ToR in which the weaknesses and strengths are described, and Conclusions and Recommendations in accordance with the ToRs.

   a. Reviewers should describe in their own words the review activities completed during the panel review meeting, including providing a brief summary of findings, of the science, conclusions, and recommendations.

   b. Reviewers should discuss their independent views on each ToR even if these were consistent with those of other panelists, and especially where there were divergent views.

   c. Reviewers should elaborate on any points raised in the Summary Report that they feel might require further clarification.

   d. Reviewers shall provide a critique of the NMFS review process, including suggestions for improvements of both process and products.

   e. The CIE independent report shall be a stand-alone document for others to understand the weaknesses and strengths of the science reviewed, regardless of whether or not they read the summary report. The CIE independent report shall be an independent peer review of each ToRs, and shall not simply repeat the contents of the summary report.

3. The reviewer report shall include the following appendices:

   Appendix 1: Bibliography of materials provided for review
   Appendix 2: A copy of the CIE Statement of Work
   Appendix 3: Panel Membership or other pertinent information from the panel review meeting.

Annex 2: Terms of Reference for the Peer Review

Stock Assessment Review (STAR) Panel 3

1. Become familiar with the draft stock assessment documents, data inputs, and analytical models along with other pertinent information (e.g. previous assessments and STAR panel report when available) prior to review panel meeting.
2. Discuss the technical merits and deficiencies of the input data and analytical methods during the open review panel meeting.
3. Evaluate model assumptions, estimates, and major sources of uncertainty.
4. Provide constructive suggestions for current improvements if technical deficiencies or major sources of uncertainty are identified.
5. Determine whether the science reviewed is considered to be the best scientific information available.
6. When possible, provide specific suggestions for future improvements in any relevant aspects of data collection and treatment, modeling approaches and technical issues, differentiating between the short-term and longer-term time frame.
7. Provide a brief description on panel review proceedings highlighting pertinent discussions, issues, effectiveness, and recommendations.

Annex 3: Tentative Agenda

TBD
Stock Assessment Review (STAR) Panel 3
NMFS Southwest Fisheries Science Center
110 Shaffer Road
Santa Cruz, California

July 24-28, 2017

Appendix 3: Panel Membership
In alphabetical order

Panayiota Apostolaki, CIE reviewer
Robin Cook, CIE reviewer
Martin Dorn, NMFS, Alaska Fisheries Science Center, STAR Chair
Owen Hamel, NMFS, Northwest Fisheries Science Center,